

## Dimensional Analysis

1. How many seconds are in 24 hours?

Plan: ① Hour  $\Rightarrow$  Second? Larger unit to smaller unit

② Hour  $\rightarrow$  minute  $\Rightarrow$  second

③ 1 Hr = 60 mins    1 min = 60 secs

Work:

$$24 \text{ hours} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = \boxed{8.6 \times 10^4 \text{ Secs}} \quad (2 \text{ s.f.})$$

This unit goes on the bottom because you can cancel them!

This is what you left with.

2. Convert 87.6 mg to Kilo-gram.

Plan: ① mg  $\Rightarrow$  kg? Smaller unit to larger unit

② mg  $\rightarrow$  g  $\Rightarrow$  kg

③  $1 \text{ mg} = \frac{0.001 \text{ g}}{\div 1000}$      $1 \text{ g} = \frac{0.001 \text{ kg}}{\div 1000}$

Work:

$$87.6 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = \boxed{8.76 \times 10^{-5} \text{ kg}} \quad (3 \text{ s.f.})$$

This is what you left with.

3. 0.0962 km/min to m/s

Plan: ① 1 km = 1000 m    1 min = 60 secs

$$\frac{0.0962 \text{ km}}{1 \text{ min}} = \frac{0.0962 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}}}{1 \text{ min} \times \frac{60 \text{ sec}}{1 \text{ min}}} = \boxed{1.60 \text{ m/s}} \quad (3 \text{ s.f.})$$

These are final units.



4.  $87.4 \text{ cm}^2$  to  $\text{mm}^2$

Plan:  $1 \text{ cm} = 10 \text{ mm}$   
 $(1 \text{ cm})^2 = (10 \text{ mm})^2$   
 $1 \text{ cm}^2 = 100 \text{ mm}^2$

Work:  $87.4 \text{ cm}^2 \times \frac{100 \text{ mm}^2}{1 \text{ cm}^2} = \boxed{8740 \text{ mm}^2}$   
3. sig

Alternative:

$$87.4 \text{ cm}^2 \times \frac{(10 \text{ mm})^2}{(1 \text{ cm})^2} = 87.4 \text{ cm}^2 \times \frac{100 \text{ mm}^2}{1 \text{ cm}^2} = \boxed{8740 \text{ mm}^2}$$

When doing calculation with exponent,  
always remember everything inside  
the parenthesis!